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HIGH SCHOOL AND UNIVERSITY MATRICULATION
EXAMINATIONS BOARD

DEPARTMENTAL EXAMINATIONS, 1968

CHEMISTRY 30

Time — 2 hours.

Total Possible Mark — 210.

Note—DO NOT SPEND TOO MUCH TIME ON ANY ONE QUESTION. READ THE DIRECTIONS FOR EACH QUESTION CAREFULLY.

Do not write your name on this booklet.

Mathematical tables may be used.
Slide rules are permitted.

Pages 2A and 2B contain the Periodic Table and an Oxidation Potential Table. These pages, for convenience, should be torn along the perforation for ready reference when required.

Answers to questions 1 to 58 will be machine scored. Record your answers on the separate answer sheet provided.

Answers to questions 59 to 70, inclusive, are to be recorded in this booklet.

Rough work and diagrams may be done in pencil.
Finished work must be done in ink (blue or black, pen or ballpoint).

In solutions to problems enough work must be shown to indicate the method used.
Include units.

DO NOT FOLD THE BOOKLET.

Place your answer sheet **BEHIND** the test booklet and **INSERT BOTH IN THE SAME ENVELOPE** in such a way that the **UPPER LEFT-HAND CORNER OF THE BOOKLET** (Candidate's Number) shows through the **SLASHED CORNER** of the answer envelope.

BE SURE TO SEAL THE ENVELOPE.

USE THE ATOMIC WEIGHTS SHOWN IN THE PERIODIC TABLE.

Gas Constant, R = 0.0821 liters-atmospheres per degree-mole.
1 faraday = 96,500 coulombs.

Booklet Score
Machine Score
Final Score

(For the use of Sub-examiners only)

54
19
68
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In questions 1 to 58 inclusive, select the BEST answer of the four given answers and record it on the separate answer sheet provided.

EXAMPLE	ANSWERS	ANSWER SHEET
The formula for sulphuric acid is	A. H_2SO_5 B. H_2SO_4 C. H_2SO_3 D. H_2SO_2	A ☐ B ■ C ☐ D ☐ E ☐ DISREGARD COLUMN "E" ON ANSWER SHEET.

Each correct answer has a value of 2 marks for questions 1 to 58.

You may use an ORDINARY HB PENCIL to mark your answers on the answer sheet. Make certain that your answer marks are heavy and black. If you change your mind about an answer, be sure to erase your first mark completely. There should be no stray marks on your answer sheet and only one answer marked for each question.

1. The elements in Group 1A of the Periodic Table

1.
A. have low ionization energies
B. have a high attraction for electrons
C. gain one electron in ion formation
D. form covalent molecules of 2 atoms

2. A white crystalline substance melts below 100° C. It does not conduct electricity either as a solid or when melted. This substance is most likely to be a

2.
A. pure metal
B. covalent solid
C. molecular solid
D. ionic compound

3. A gas behaves most nearly like an ideal gas when under conditions of

3.
A. high pressure and low temperature
B. low pressure and high temperature
C. low pressure and low temperature
D. high pressure and high temperature

4. The oxidation number for copper in the complex compound $Cu(NH_3)_4Cl_2$ is

4.
A. 1
B. 2
C. 3
D. 6

ROUGH WORK ONLY

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Tear this page out for ready reference when required.

PERIODIC TABLE

←TRANSITION ELEMENTS→ GROUP

PERIOD	GROUP 1A	2A	3B	4B	5B	6B	7B	←8B	8B	8B→	1B	2B	GROUP 3A	4A	5A	6A	7A	GROUP 0
1											1 H 1.0							2 He 4.0
2	3 Li 6.9	4 Be 9.0											5 B 10.8	6 C 12.0	7 N 14.0	8 O 16.0	9. F 19.0	1.0 Ne 20.2
3	11 Na 23.0	12 Mg 24.3											13 Al 27.0	14 Si 28.1	15 P 31.0	16 S 32.1	17 Cl 35.5	18 Ar 39.9
4	19 K 39.1	20 Ca 40.1	21 Sc 45.0	22 Ti 47.9	23 V 50.9	24 Cr 52.0	25 Mn 54.9	26 Fe 55.8	27 Co 58.9	28 Ni 58.7	29 Cu 63.5	30 Zn 65.4	31 Ga 69.7	32 Ge 72.6	33 As 74.9	34 Se 79.0	35 Br 79.9	36 Kr 83.8
5	37 Rb 85.5	38 Sr 87.6	39 Y 88.9	40 Zr 91.2	41 Nb 92.9	42 Mo 95.9	43 Tc - - -	44 Ru 101.1	45 Rh 102.9	46 Pd 106.4	47 Ag 107.9	48 Cd 112.4	49 In 114.8	50 Sn 118.7	51 Sb 121.8	52 Te 127.6	53 I 126.9	54 Xe 131.3
6	55 Cs 132.9	56 Ba 137.3	57-71 See La Series	72 Hf 178.5	73 Ta 181.0	74 W 183.9	75 Re 186.2	76 Os 190.2	77 Ir 192.2	78 Pt 195.1	79 Au 197.0	80 Hg 200.6	81 Tl 204.4	82 Pb 207.2	83 Bi 209.0	84 Po (210)	85 At - - -	86 Rn (222)
7	87 Fr - - -	88 Ra 226.0	89-103 See Ac Series															

La Series	57 La 138.9	58 Ce 140.1	59 Pr 140.9	60 Nd 144.2	61 Pm - - -	62 Sm 150.4	63 Eu 152.0	64 Gd 157.3	65 Tb 158.9	66 Dy 162.5	67 Ho 164.9	68 Er 167.3	69 Tm 168.9	70 Yb 173.0	71 Lu 175.0
Ac Series	89 Ac (227)	90 Th 232.0	91 Pa (231)	92 U 238.0	93 Np —	94 Pu —	95 Am —	96 Cm —	97 Bk —	98 Cf —	99 Es —	100 Fm —	101 Md —	102 No —	103 Lw —

This Oxidation Potential Table may be torn out for your convenience.

$Li \longrightarrow Li^+ + 1e$	+3.00 volts
$Rb \longrightarrow Rb^+ + 1e$	+2.92 volts
$K \longrightarrow K^+ + 1e$	+2.92 volts
$Ba \longrightarrow Ba^{++} + 2e$	+2.90 volts
$Sr \longrightarrow Sr^{++} + 2e$	+2.89 volts
$Ca \longrightarrow Ca^{++} + 2e$	+2.87 volts
$Na \longrightarrow Na^+ + 1e$	+2.71 volts
$Al \longrightarrow Al^{+++} + 3e$	+1.66 volts
$Fe \longrightarrow Fe^{++} + 2e$	+0.44 volt
$Cd \longrightarrow Cd^{++} + 2e$	+0.40 volt
$Ag + I^- \longrightarrow AgI + 1e$	+0.15 volt
$Sn \longrightarrow Sn^{++} + 2e$	+0.14 volt
$H_2 \longrightarrow 2H^+ + 2e$	0.00 volt
$Sn^{+2} \longrightarrow Sn^{+4} + 2e$	−0.15 volt
$Cu^+ \longrightarrow Cu^{++} + 1e$	−0.15 volt
$SO_{2(g)} + H_2O \longrightarrow SO_4^{=} + 4H^+ + 2e$	−0.17 volt
$Cu_{(s)} \longrightarrow Cu^{++} + 2e$	−0.34 volt
$Cu_{(s)} \longrightarrow Cu^+ + 1e$	−0.52 volt
$Fe^{++} \longrightarrow Fe^{+++} + 1e$	−0.77 volt
$2Hg \longrightarrow Hg_2^{++} + 2e$	−0.78 volt
$Hg_2^{++} \longrightarrow 2Hg^{++} + 2e$	−0.92 volt
$2H_2O \longrightarrow O_{2(g)} + 4H^+ + 4e$	−1.23 volts
$2Cr^{+3} + 7H_2O \longrightarrow Cr_2O_7^{=} + 14H^+ + 6e$	−1.33 volts

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5. If the gram molecular volume were chosen to be 33.6 liters at S.T.P. the weight of a mole of carbon atoms would be

5. A. 6.00 gm
B. 12.00 gm
C. 18.00 gm
D. 24.00 gm

6. 7.00 grams of a gas occupies 11.2 liters at one atmosphere pressure and 546° K. The gas could be

6. A. CO
B. Ar
C. O_2
D. CO_2

7. The difference between heavy hydrogen and the more common form of hydrogen is that heavy hydrogen ($_1H^2$)

7. A. does not occur in nature
B. is naturally radioactive
C. has one more atom per molecule
D. has one more neutron in the nucleus

8. The most stable arrangement of 4 "p" electrons in the outermost shell of an atom is

8. A. unpaired
B. two pairs
C. none in pairs
D. one pair and two unpaired

9. Which of these compounds would have the highest melting point?

9. A. LiCl
B. $BaCl_3$
C. CCl_4
D. NCl_3

10. A mixture of 2.0 grams of hydrogen and 32 grams of oxygen is exploded and produces water. What weight of gas remains uncombined?

10. A. 1.0 gm
B. 8.0 gm
C. 16.0 gm
D. 24.0 gm

11. If each gas is at S.T.P., 2.016 grams of hydrogen gas contains the same number of molecules as

11. A. 16 grams of oxygen
B. 2.016 grams of nitrogen
C. 2.016 moles of helium
D. 22.4 liters of chlorine

ROUGH WORK ONLY

12. Two compounds of carbon and oxygen which best illustrate the Law of Multiple Proportions are those whose weight ratios are 4.2 to 5.6 and

A. 4.2 to 11.2
B. 4.2 to 8.1
C. 4.2 to 6.0
D. 4.2 to 3.1

Questions 13 through 16 refer to types of bonds which may occur in compounds.

(1) non-polar covalent
(2) co-ordinate covalent
(3) polar covalent
(4) ionic

13. The thermal stability of alkali metal salts is due primarily to

A. 1
B. 2
C. 3
D. 4

14. The type of bonding which causes liquid solvents having dipoles to be good solvents for ionic compounds is

A. 1 and 2
B. 2 and 4
C. 3 only
D. 4 only

15. The thermal stability of a diamond is due to

A. 1 only
B. 2, 3 and 4
C. 3 only
D. 4 only

16. The solid methyl ammonium chloride exhibits

A. 1 and 2
B. 3 and 4
C. 1, 3 and 4
D. 2, 3 and 4

17. Gases A, B and C are stored (as a mixture) in a cylinder in which the total pressure is 1000 pounds per square inch absolute (p.s.i.a.). The partial pressure of A is 250 p.s.i.a. and the partial pressure of B is 300 p.s.i.a. Therefore the number of molecules of C must be

A. less than A
B. less than B
C. less than A plus B
D. equal to A plus B

ROUGH WORK ONLY

18. A spectacular exothermic reaction can be represented by

$$2Al + Fe_2O_3 \longrightarrow Al_2O_3 + 2Fe$$

Using the associated thermochemical data indicated by

$$2Al + \frac{3}{2} O_2 \longrightarrow Al_2O_3 + 400 \text{ kcal}$$

and

$$2Fe + \frac{3}{2} O_2 \longrightarrow Fe_2O_3 + 200 \text{ kcal}$$

select a value which represents the number of kilocalories per mole of aluminum which could be produced by the reaction of aluminum with ferric oxide

18.
A. 100
B. 200
C. 400
D. 600

19. Shown are the probable electron distribution in the two outside shells of certain elements. Which would have the greatest tendency to exhibit several oxidation states?

19.
A. s^2p^6 : s^1
B. s^2p^6 : s^2
C. $s^2p^6d^6$: s^2
D. $s^2p^6d^{10}$: s^2

20. Copper metal reacts with dilute nitric acid according to

$$3Cu_{(s)} + 8H^+_{(aq)} + 2NO^-_{3(aq)} \rightarrow 3Cu^{++}_{(aq)} + 2NO_{(g)} + 4H_2O_{(e)}$$

How many moles of nitric acid would be needed to produce one mole of nitric oxide?

20.
A. one
B. two
C. three
D. four

ROUGH WORK ONLY

21. With the aid of the Periodic Table one could predict the element Z = 34

21. A. forms bonds which are highly ionic with element 15

B. in a water solution would form ions having a –4 charge

C. forms compounds in which its "oxidation number" varies from –2 to +6

D. is less metallic than element 8

22. Ionization potential data for Group 1A indicates that lithium, Li, holds its electrons most closely. Oxidation potential data indicates that Li gives off its electron most readily. Which of the following statements, all of which are true, is a plausible explanation for this seeming discrepancy?

22. A. Lithium is the best reducing agent of the group

B. The very small lithium ion has a large heat of hydration which offsets the higher energy required to pull off the electron

C. Ionization potential is an endothermic measurement while oxidation potential is an exothermic measurement

D. Lithium solid is a polymerized structure, $Li_{(x)}$

23. The best solvent for sulfur, S_8 is

23. A. NH_4OH

B. H_2O

C. C_6H_6

D. H_2SO_4

24. At any given temperature and pressure the relative diffusion rates of methane, CH_4 and sulfur dioxide, SO_2 are

24. A. 1 : 2

B. 2 : 1

C. 1 : 4

D. 4 : 1

25. From the elements position on the Periodic Table, one would predict that

25. A. element 37 is a better oxidizing agent than element 3

B. element 9 is a better reducing agent than element 35

C. element 3 loses electrons less readily than element 37

D. element 86 loses electrons most readily of all elements listed

ROUGH WORK ONLY

26. If a rigid container holds 6 grams of dry gas at 3 atmospheres and 400° K, how many grams of gas would it hold at 2 atmospheres and 200° K?

26.
A. 4.5
B. 6.0
C. 8.0
D. 18.0

27. 28.05 grams of KOH, potassium hydroxide is dissolved to form one liter of solution. If 25.00 ml of sulfuric acid exactly neutralizes 25.00 ml of the base then the molarity of the acid is

27.
A. 0.50 M
B. 0.25 M
C. 0.028 M
D. 0.0125 M

28. Which of the following do not increase the electrical conductivity of water?

(1) NH_4OH
(2) HCl
(3) NaCl
(4) H_2CO_3
(5) CH_3COOH
(6) $C_6H_{12}O_6$
(7) $HgCl_2$
(8) MCH_3COCH_3

28.
A. 5 only
B. 5, 6 and 7
C. 4, 5, 6 and 8
D. 6 and 8

29. 60 ml of a 0.2N NaOH is mixed with 40.0 ml of 0.05N HCl. If the volumes are additive the final concentration of the OH^- ion is

29.
A. 0.1 M
B. 0.2 N
C. 0.12 M
D. 0.25 N

30. Lithium carbonate, Li_2CO_3 has an exothermic heat of solution. Which of the following steps involve the greatest energy change?

30.
A. breaking down the crystal lattice
B. pushing aside the solvent particles to make room for the solute particles
C. the attraction of ions to the water molecules
D. the energy of association in the formation of HCO_3^-

ROUGH WORK ONLY

31. Which of the following statements explains why hydrogen chloride gas HCl, remains a non-conductor when dissolved in toluene (an organic solvent)?

31. A. Toluene is an unsymmetrical molecule
B. HCl is non-polar
C. HCl has a very low solubility in toluene
D. HCl will not release protons to toluene

32. Under the same conditions which mixture of 1M KOH and 1M H_2SO_4 by volume, produce the highest temperature?

32. A. 67 – 33 ml
B. 60 – 40 ml
C. 50 – 50 ml
D. 25 – 75 ml

Questions 33 through 35 refer to the following data obtained in determining the concentration of a NaOH solution:

Weight of oxalic acid, $H_2C_2O_4$, and beaker	19.0 gm
Weight of beaker	10.0 gm
Volume of acid solution	500 ml
Volume of acid solution used in titration	16.0 ml
Volume of base used in titration	6.0 ml

33. The concentration of the standard solution is

33. A. 0.10 M
B. 0.20 M
C. 0.50 M
D. 0.26 M

34. The weight of one gram equivalent of acid is

34. A. 90 gm
B. 45 gm
C. 9 gm
D. 180 gm

35. The final concentration of the sodium hydroxide is

35. A. 0.53 M
B. 0.75 M
C. 1.07 M
D. 0.125 M

ROUGH WORK ONLY

36. The heat of reaction per mole of water produced by the neutralization of a strong base, KOH, is less when acetic acid is used than when hydrochloric acid is used. Which of the following is a possible explanation for this?

36.
A. potassium acetate is a non-electrolyte in water
B. acetic acid is a triprotic acid
C. less water is produced when acetic acid is used
D. some of the heat of neutralization is used to break hydrogen-acetate bonds

37. An increase of 10° C doubled the rate of reaction between two gases. The explanation for this increase in reaction rate is the

37.
A. pressure is doubled
B. concentration of the reactants is doubled
C. number of intermolecular collisions per unit of time is doubled
D. number of particles with an energy above a minimum activation energy is doubled

38. The reaction

$So_{2(g)} + \frac{1}{2}O_{2(g)} \longrightarrow SO_{3(g)}$

is catalyzed by NO. The rate of the reaction is proportional to the concentration of the oxygen and the nitric oxide but not the sulfur dioxide. This fact implies that

38.
A. stoichiometric expressions do not of necessity indicate reaction mechanisms
B. $SO_{2(g)} + NO_{(g)} \longrightarrow SO_{3(g)} + \frac{1}{2}N_{2(g)}$ is the rate controlling step
C. doubling the concentration of O_2 will not affect the rate of reaction
D. doubling the concentration of SO_2 will double the rate of reaction

ROUGH WORK ONLY

39. Which of the following best explains how catalysts increase the rate of a chemical reaction?

39.
A. They reduce the amount of product
B. They reduce the amount of reactant required
C. They introduce intermediate steps in the reaction which require less energy
D. They raise the temperature of the reaction

40. The rate equation for a reaction was determined to be

$$R = k\,[A]^2\,[B]$$

The most probable equation for the rate-determining step is

40.
A. $A + B \longrightarrow$ Products
B. $A + 2B \longrightarrow$ Products
C. $2A + B \longrightarrow$ Products
D. $A_2 + B \longrightarrow$ Products

41. Graphite has a very high melting point. Which of the following statements best explains this?

41.
A. Each carbon atom has 4 bonding electrons
B. Each carbon atom is covalently bonded to three other carbon atoms
C. The bond length between carbon atoms is 1.42 Å
D. van der Waals forces exist within the molecules

42. The number of isomers possible for pentane is

42.
A. 2
B. 3
C. 4
[✓ D. 5]

43. Which of the following compounds would be the most reactive?

43.
A. C_2H_6
B. C_6H_6
C. C_4H_6
D. C_6H_{12}

44. Proteins are high polymers of

44.
A. amines
B. amides
C. amyl alcohol
D. amino acids

ROUGH WORK ONLY

45. When ammonia is treated with methyl iodide the product is

45.
- A. CH_3NH_2
- B. $(CH_3)_2NH$
- C. $(CH_3)_3N$
- D. a mixture of all three compounds

46. Which of the following statements about fats is FALSE?

46.
- A. a fat is a solid at room temperature
- B. a fat is an unsaturated hydrocarbon
- C. a fat is an ester of a fatty acid and glycerol
- D. fats can be synthesized a process known as hydrogenation

Questions 47 through 49 refer to the four isomers of butanol.

(1) 1 – butanol
(2) 2 – butanol
(3) 2 – methyl-1-propanol
(4) 2 – methyl-2-propanol

47. When concentrated HCl is added a milky suspension would be formed by

47.
- A. 1 only
- B. 1 and 2
- C. 4 only
- D. 2, 3 and 4

48. When neutral $KMnO_4$ was added to each of the alcohols the weakest reducing agent was found to be

48.
- A. 1
- B. 2
- C. 3
- D. 4

49. The oxidation product would be a ketone for

49.
- A. 1 and 2
- B. 2 and 3
- C. 2 and 4
- D. 3 and 4

ROUGH WORK ONLY

50. A student was asked to identify an organic compound. The compound was found to possess the following properties:

(1) It was extremely volatile
(2) It was miscible with water and C_2H_5OH
(3) It gave a positive test with Fehling's solution
(4) It reacted readily with $K_2Cr_2O_7$

The compound was probably

50. A. an aldehyde
B. an acid
C. a ketone
D. an alcohol

Questions 51 and 52 refer to the following data:

A student was given three bottles, A, B, C, each containing a colorless liquid. The bottles were known to contain

(1) n – pentane
(2) n – butanol
(3) cyclohexene

51. Liquid A was tested and the following properties determined:

(1) It was immiscible in water but miscible in CCl_4
(2) It would not react with sodium metal or $K_2Cr_2O_7$
(3) When bromine was added there was no reaction

The liquid was

51. A. 1
B. 2
C. 3
D. none of these

52. Liquid B was tested and it was found to be miscible both in C_2H_5OH and water. It reacted with sodium metal to give a gas. When tested with Fehling's solution the results were negative but it reacted readily with $KMnO_4$. The liquid was probably

52. A. 1
B. 2
C. 3
D. none of these

ROUGH WORK ONLY

53. Which of the following statements concerning an electrolytic current is FALSE?

53.
A. the charge carriers are anions and cations
B. the cation is a positively charged particle
C. as the temperature increases the conductivity decreases
D. in a galvanic cell the current would be zero if the ions accumulated at the electrodes

ROUGH WORK ONLY

Questions 54 – 58 refer to the Oxidation Potential Table, (Page 2B). In all questions assume standard solutions.

54. In the electrolysis of aqueous LiOH the voltage of the anode half-cell would be

54.
A. 3.00 V
B. –3.00 V
C. 0.00 V
D. –1.23 V

55. In the electrolysis of aqueous $CuSO_4$ the equation for the reaction at the cathode is

55.
A. $Cu^{++} + 2e \longrightarrow Cu^{\circ}$
B. $Cu^{+} + 1e \longrightarrow Cu^{\circ}$
C. $Cu^{+} \longrightarrow Cu^{++} + 1e$
D. $SO_4^{=} + 4H^{+} + 2e \longrightarrow SO_{2(g)} + H_2O$

56. The voltage for a cell with AgI and Sn^{++} as reactants is

56.
A. 0.00
B. 0.01
C. –0.30
D. –0.29

57. The alkali metal which is most easily reduced is

57.
A. K
B. Li
C. Na
D. Rb

58. Which of the reactions would NOT occur spontaneously?

58.
A. $Al + Cu^{++}$
B. $Fe^{+2} + Cd^{+2}$
C. $Cr_2O_7^{=} + Hg_2Cl_2$
D. $Li + H_2$

ROUGH WORK ONLY

Values

8 **59.** Write the electron-dot formula for the following:

(a) $MgCl_2$

(b) C_5H_8

(c) Zwitter Ion
$NH_5C_2O_2$

(d) ClO_3^-

ROUGH WORK ONLY

Values

60. Explain briefly why the following statements are true:

3 (a) The boiling point of non-polar carbon tetrachloride is higher than the boiling point of polar chloroform.

2 (b) The magnitude of the equilibrium vapour pressure depends on (1) the nature of the liquid and (2) its temperature.

3 (c) Solid ionic compounds do not conduct electricity whereas aqueous solutions of these compounds do.

Values

8 **61.** Balance the following equations by the method indicated. Indicate clearly each step used.

(a) Oxidation number method

$Br_2 + KOH \longrightarrow KBrO_3 + KBr + H_2O$

(b) Half-reaction method

$CrO_2^- + HO_2^- \longrightarrow CrO_4^= + H_2O$ (basic)

ROUGH WORK ONLY

Values

10 **62.** Briefly define the following terms:

(a) diamagnetism

(b) electron affinity

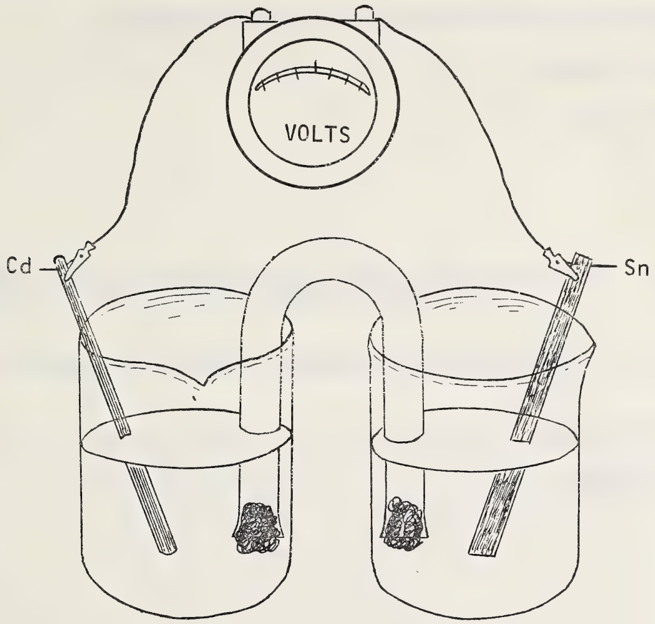
(c) core of an atom

(d) reaction mechanism

(e) dynamic equilibrium

Values

63. Question 63 refers to the following diagram of a voltaic cell.



2 (a) Write the overall reaction for this cell.

2 (b) The electrons will flow from the .... electrode

to the .... electrode.

2 (c) The purpose of the salt bridge is ....

....

....

....

2 (d) If both solutions are 1 molar the voltage of the cell would be

....

3 (e) What would be the change in weight of the cadmium electrode if this cell delivered 865 coulombs?

[OVER]

Values

12 **64.** Name the organic compounds described and draw the structural formula

(a) Methyl alcohol reacts with butyric acid to form compound X.

Compound X is called ....

Structural Formula

(b) Compound Y is formed by heating isopropyl alcohol in the presence of a copper catalyst.

Compound Y is called ....

Structural Formula

(c) Monochlorobenzene is converted to dichlorobenzene. The least abundant isomer is called ....

Structural Formula

ROUGH WORK ONLY

Do Not
Write In
This Space

Values

2 **65.** (a) How many atoms of phosphorus are there in 0.150 moles of phosphorus pentoxide, P_2O_5?

3 (b) 0.128 grams of oxygen combine with 0.190 grams of X, to give the compound XO_8. What is the atomic weight of element X?

ROUGH WORK ONLY

Values

5 **66.** Chlorine forms an oxide which is 81.59% chlorine and 18.41% oxygen. If at S.T.P. 1.12 liters of the gas weighs 4.35 grams find the molecular formula.

4 **67.** When sulfur and silver combine they do so in such a way that 2 atoms of silver combine with 1 atom of sulfur. What is the maximum number of moles of product that can be formed from 10.0 grams of silver and 1.00 grams of sulfur?

ROUGH WORK ONLY

Values

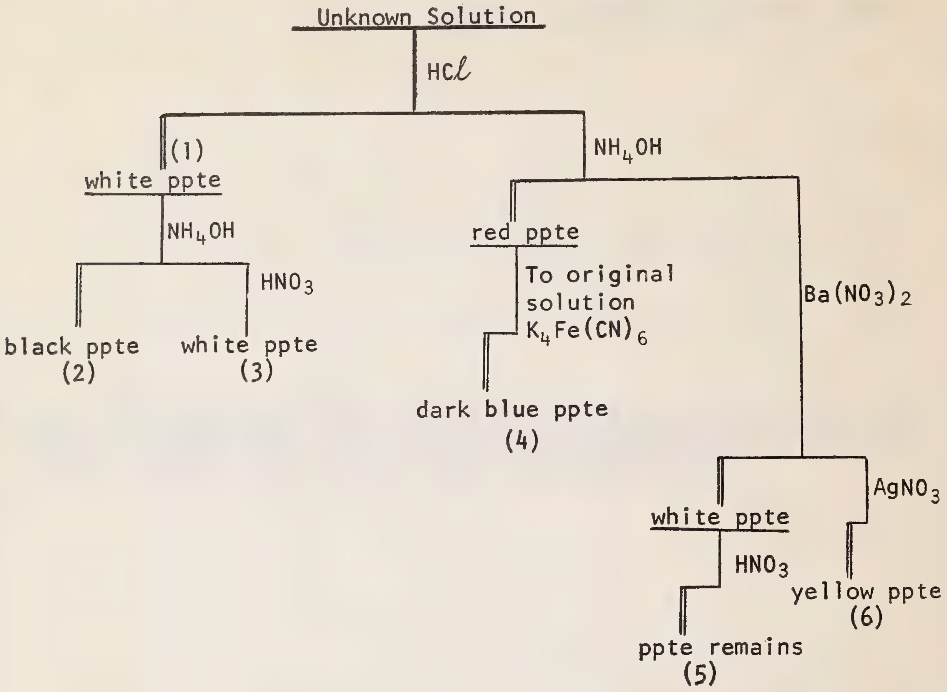
6 **68.** By reacting magnesium ribbon and hydrochloric acid, a student collects 45 ml of hydrogen gas in a eudiometer tube at 630 mm Hg and 27° C. The vapor pressure of water at 27° C is 27 mm Hg. What weight of magnesium ribbon did the student use?

$$Mg_{(s)} + 2HCl_{(aq)} \longrightarrow MgCl_{2(aq)} + H_{2(g)}$$

ROUGH WORK ONLY

Values

8 **69.** Below is a flow diagram prepared by a student after doing a cation and anion analyses in the laboratory. Each of the questions refers to a section of the flow chart marked by a number. Refer to the diagram and answer the following questions.



(a) The white precipitate formed at (1) could be .... or

....

(b) The precipitate at (2) indicates that the ion present was ....

(c) The white precipitate formed at (3) is called ....

(d) The formula for the dark blue precipitate at (4) is

....

(e) The precipitate at (4) confirms the presence of the ....

(f) The white precipitate at (5) shows that the ion present is ....

(g) The yellow precipitate at (6) confirms the presence of ....

Values

70. Given 3 test tubes containing 2 ml of 0.1 M NaI, NaBr, NaCl respectively. To each was added 1 ml of chlorine water and 1 ml of carbon tetrachloride.

2 (a) What was the purpose of adding chlorine water?

2 (b) Why was CCl_4 added?

2 (c) The best reducing agent is

3 (d) When the test tubes were shaken after the addition of chlorine water and CCl_4 what decisive color change was noted in each test tube?

Test tube #1

Test tube #2

Test tube #3

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